9.0 AIR QUALITY AND CLIMATE

9.1 Introduction

This section of the EIAR has been prepared by TMS Environment Ltd and assesses the impacts on the environment with respect to air quality associated with the proposed quarry extension at the existing Breedon Cement Ltd facility in Kinnegad, Co. Meath. This Chapter was prepared by Dr. Imelda Shanahan and Nathaniel Blue of TMS Environment Ltd. Imelda has over 30 years professional experience in preparing assessments of this type for various different types of development. Imelda has a BSc (Hons) in Chemistry from University College Dublin and a PhD in Physical Chemistry. She is a Chartered Chemist and a Fellow of the Institute of Chemistry of Ireland and a Fellow of the Royal Society of Chemistry. Nathaniel has a Masters in Environmental Sciences from Trinity College Dublin (2021) and a BSc in Environmental Science from the University of Seattle (2020).

The potential impacts of the proposed development on air quality are identified and the associated mitigation measures are discussed. Impacts of site operations are considered by taking account of the existing baseline, the projected impacts and compliance with relevant standards.

9.2 Characteristics of the proposed development

The proposed development will consist of the deepening of the north-western portion of the existing limestone quarry to 10m OD, which is consistent with the level approved for the adjoining quarry extraction area, as permitted under planning ref. 98/2026 (An Bord Pleanála ref. PL17.111198). This will involve the deepening of the north-western portion of the quarry extraction area by four extractive benches to 10m OD, over an area of c. 4.13 hectares. The proposed development will not result in any increase to the output of the existing limestone quarry or to the production capacity of the existing cement plant. The proposed development will be served by the existing on site haul road from the existing vehicular access point on the L8021 to the northeast of the site. The extent of the proposed development relative to the land ownership boundaries is shown in Figure 9.2.1.

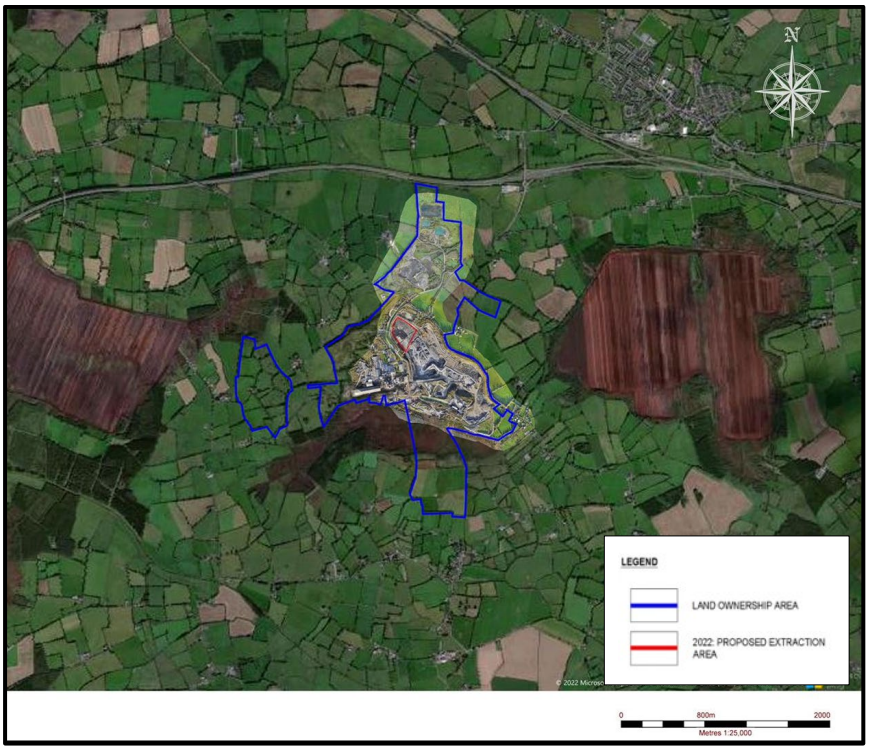

Figure 9.2.1: Site location and context

9.3 Methodology

9.3.1 Study Area

Air quality impacts of the proposed project on receptors which could potentially be affected by the proposed development are considered in this Chapter of the EIAR. The study area includes all areas that could potentially be affected by the emissions from the proposed project. The study area for the Construction Phase air quality impact assessment was defined according to the Institute of Air Quality Management's (IAQM's) *Guidance on the Assessment of Dust from Demolition and Construction* (IAQM 2014), and includes sensitive receptors (e g houses, schools, and hospitals) that are located within 350m of construction activities.

The study area for the Operational Phase air quality assessment includes receptors and ecological designated sites that could be affected by the proposed project. The study area for the Operational Phase air quality assessment was determined using professional judgement and from a consideration of the potential impacts on receptors located near the proposed project. The potential impact on human receptors does not extend beyond a distance of 350m from the centre of the proposed development site.

9.3.2 Impact Assessment Methodology

9.3.2.1 Construction Phase assessment methodology

The impact assessment methodology involves identification and characterisation of the air quality impacts that may be associated with the proposed project, characterisation of the baseline environment to benchmark the existing situation, quantitative prediction of air quality impacts and assessment of the impacts against recognised Air Quality Standards (AQS) and Guidelines. From this assessment comes a definition of mitigation measures that may be required to ensure that the potential construction phase impacts of the proposed project are

managed and controlled to protect human health, the environment, and amenity.
The impacts on air quality from the Construction Phase could arise through the generation and subsequent deposition of dust and elevated local PM_{10} concentrations.

9.3.2.2 Operation Phase assessment methodology

The effects of the proposed project during the operation phase are described by considering the possible impacts that could occur as a result of the proposed project, the probability of their occurrence and the nature and significance of such impacts. The Environmental Protection Agency's (EPA's) Guidelines *on the Information to be Contained in Environmental Impact Assessment Reports* (2022) take account of Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment and have been considered in this assessment. Impacts are described in the Guidelines under various headings which are summarised as follows:

- Probability – likely, possible, unlikely;
- Quality – positive, neutral, negative;
- Significance – e.g. Imperceptible, Moderate, Profound; and
- Magnitude – duration, frequency, extent, context.

A description of the significance of effects is presented in Table 9.3.1, which shows the approach taken to quantifying the significance and magnitude of potential air quality impacts in this assessment.

In addition to considering the above guidance, the general approach adopted for the air quality impact assessment is summarised as follows:

- Describe the existing baseline air quality at the proposed project site and in the vicinity of receptors;
- Describe the potential impacts of the proposed project on air quality;
- Identify appropriate criteria against which to assess the significance of the impacts associated with the proposed project;
- Propose avoidance and mitigation measures where required; and
- Identify and assess all cumulative impacts with potential to impact upon the baseline environment.

Table 9.3.1: Describing the Significance and Magnitude of Environmental Effects (EPA 2022)

Aspect	Description
Significance of Effects	
Imperceptible	An effect capable of measurement but without significant consequences
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant	An effect which, by its character, magnitude, duration or intensity, alters most of a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity,

	significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics
Magnitude of Effects	
Extent	This is described by the size of the area, the number of sites and the proportion of the population affected by the effect.
Duration	**Momentary** effects last seconds to minutes.
	Brief effects last less than a day.
	Temporary effects last less than one year.
	Short-term effects last from one to seven years.
	Medium-term effects last from seven to 15 years.
	Long-term effects last from 15 to 60 years.
	Permanent effects last over 60 years.
	Reversible effects are effects that can be undone for example through remediation or restoration
Frequency	How often the effect will occur
Context	The contextual relationship between the effect and the existing baseline; it is important to establish if the effect is unique or commonly or increasingly experienced.

9.3.2.3 Methodology for Assessing Impacts on Climate Change

The potential climate impact of the proposed project is assessed by comparing the total emissions of Greenhouse Gases (GHG) with those that would occur if the site was left as it is. This assessment provides information on how the proposed development considers national climate change objectives in the selection of the preferred approaches for the proposed development.

The principal GHG emissions associated with the proposed development are carbon dioxide (CO_2) in the emissions from machinery used for quarrying and transport to the on-site cement plant where the materials will be utilised in the cement manufacturing process. For the purposes of this assessment the proposed development is compared with a *Do Nothing* scenario and evaluated. Therefore, 2 scenarios have been assessed as follows:

- Scenario 1 – Do Nothing, in this scenario, there will be no development at the site; and
- Scenario 2 – Do Something (proposed Project), in this scenario the proposed development is assessed.

The assessment estimates the total GHG emissions from direct and indirect activities associated with the proposed project. Overall emissions over the lifetime of the project are considered. The assessment is presented in terms of relative GHG emissions from the various sources and while there are some uncertainties, the assessment allows a reliable comparison of the Climate Impact of the proposed project relative to the Do Nothing scenario.

9.3.2.4 Methodology for Assessing Cumulative Impacts

The cumulative impacts of known permitted developments with the proposed developed were considered using the same methodologies as outlined above. The consideration of the potential incremental impact of the other known developments in combination with those of the subject development leads to a conclusion in respect of cumulative impacts.

9.3.3 Impact Assessment Criteria

Air Quality Standards (AQS) in Ireland have been defined to ensure compliance with European Commission Directives; they are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories: limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on World Health Organisation (WHO) guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The WHO Guidelines differ from the European Union Air Quality Standards (EU AQS) in that they are primarily set to protect public health from the effects of air pollution, whereas AQS are recommended by governments, and other factors, such as socio-economic factors, may be considered in setting the standards.

The AQS and guidelines referenced in this report are summarised in Table 9.3.2. These criteria have been chosen to ensure that the potential impacts of the proposed project during both the Construction Phase and the Operational Phase will be benchmarked against appropriate standards. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (Clean Air for Europe Directive) is an amalgamation of Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management (Air Quality Framework Directive) and its subsequent daughter Directives and sets out limit and target values for named air quality parameters. The Clean Air for Europe Directive was transposed into Irish legislation by the Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (Fourth Daughter Directive) was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I. No. 58 of 2009). These Directives and the Irish Regulations set out the main standards against which the potential impacts of the proposed project on air quality are assessed, as summarised in Table 9.3,2.

In addition to the Air Quality Standards Regulations 2011 and the Clean Air for Europe Directive standards, it is also appropriate to consider the WHO Guidelines. These Guidelines were developed by the WHO to provide appropriate air quality targets worldwide, based on the latest health information available. The air quality guidelines for PM_{10}, NO_2 and SO_2, and $PM_{2.5}$ are considered in this Chapter. While the WHO Guidelines are not mandatory, they represent the current informed opinion on the levels to which we should be aspiring in order to minimise the adverse health impacts of air pollution. The WHO guidelines referenced in this report are summarised in Table 9.3.3

There are no national or European AQS with which dust deposition can be compared. However, a figure of 350mg/m^2/day, based on the German Standard, Technical Instructions on Air Quality Control (TA Luft) Regulations, is commonly applied by Local Authorities and the Environmental Protection Agency (EPA) to ensure that no nuisance effects will result from specified industrial activities.

Table 9.3.2: Air Quality Standards Regulations 2011 (based on EU Clean Air For Europe [CAFE] Directive 2008/50/EC)

Pollutant	EU Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m^3 NO_2
		Annual limit for protection of human health	None	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO +NO_2
Sulphur Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of human health and ecosystems	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3
		Annual limit for protection of human health	20%	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health (Stage 1)	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3
		Annual limit for protection of human health (Stage 2)	None To be achieved by 2020	20 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)
Benzene	2008/50/EC	Annual limit for protection of human health	0% by 2010	5 µg/m^3

NOTE The Air Quality Standards Regulations 2011 (SI 180 of 2011) transposed EU Directive 2008/50/EC (CAFE) into **Irish** law.

Table 9.3.3: WHO Air Quality Standards

Pollutant	Limit Type	2005 Guidelines	2021 Guidelines
Nitrogen Dioxide	Hourly limit for protection of human health	200 µg/m^3	NA
	Annual limit for protection of human health	40 µg/m^3	10 µg/m^3
	24-hour limit for protection of human health	NA	25 µg/m^3 Note [1]
Sulphur Dioxide	Daily limit for protection of human health	20 µg/m^3	40 µg/m^3 Note [1]
	10-minute limit for protection of human health	500 µg/m^3	NS
Particulate matter (as PM_{10})	24-hour limit for protection of human health	50 µg/m^3	45 µg/m^3 Note [1]
	Annual limit for protection of human health	20 µg/m^3	15 µg/m^3
Particulate matter (as $PM_{2.5}$)	24-hour limit for protection of human health	25 µg/m^3	15 µg/m^3 Note [1]
	Annual limit for protection of human health	10 µg/m^3	5 µg/m^3

Note [1] Expressed as the 99th percentile

9.4 The Receiving Environment

9.4.1 Meteorological conditions

The magnitude of potential impacts of the proposed development on air and climate will largely be influenced by the local meteorological conditions, in particular by wind speed and direction and by precipitation rates. An evaluation of the climatic conditions at the site is therefore useful for an assessment of the type required for this study.

Met Éireann operate a Synoptic Network of weather stations at Belmullet, Malin Head, Johnstown Castle, Birr, Clones, Kilkenny and Mullingar while the Aviation Division of Met Éireann maintains observing stations at Shannon Airport, Knock Airport, Casement Aerodrome, Dublin Airport and Cork Airport. There is no continuous meteorological monitoring station located uniquely close to the Breedon Cement Ltd site, but comprehensive monitoring data is available for Corbetstown, located about 14km northeast of the site. For the purpose of obtaining reliable information about the climatological conditions at the site of the proposed development, meteorological data for the period 2018 – 2022 recorded at Corbetstown was analysed. This data is expected to be a reliable indicator of conditions at the site. The next closest meteorological monitoring station to the site is located at Mullingar, approximately 16km north of the site. Additional data from this station was also reviewed as part of this assessment. The data are presented in Table 9.4.1.

Table 9.4.1: Mean annual temperature and rainfall for Mullingar and Corbetstown

Year	Mean Temperature, °C		Rainfall, mm	
	Mullingar	Corbetstown	Mullingar	Corbetstown
2018	9.5	NR	782	775
2019	9.5	NR	1091	944
2020	9.6	NR	1079	1042
2021	9.9	NR	981	888
2022 (to April)	7.6	NR	328	276
Mean (2018-2021)	9.6	NR	983	912

Note NR: Not Reported

The magnitude of potential impacts of emissions from the facility will be substantially influenced by the local meteorological conditions, in particular by wind speed and direction and also by precipitation rates. Comprehensive monitoring data is available for Mullingar which is located approximately 16km north of the facility. This data is expected to be a reliable indicator of conditions at the site. A representative windrose for 2016 - 2020 is shown in Figure 9.4.1 and individual windroses for each of the years 2016 - 2020 are presented in Appendix 9.1. Analysis of the monitoring data shows that the dominant wind direction is from the S-SW-W quadrant, with in excess of 50% of wind directions in this quadrant.

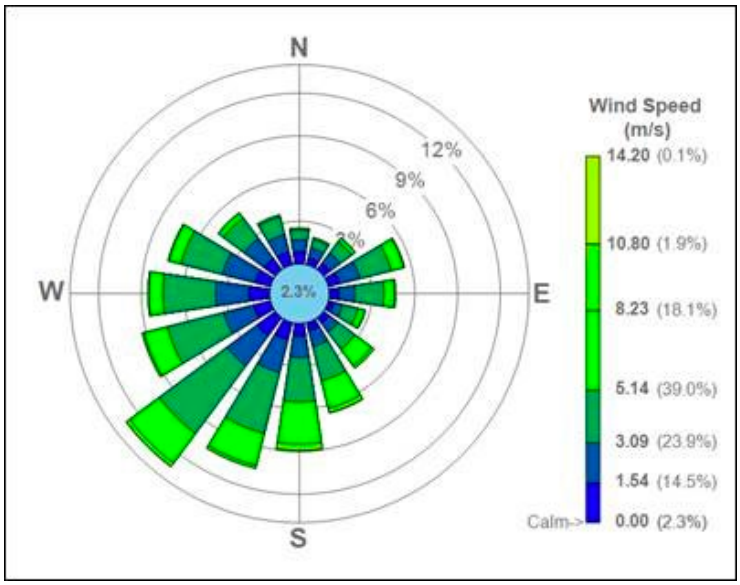

Figure 9.4.1: 2016 - 2020 composite Windrose for Mullingar

9.4.2 Influences on Ambient Air Quality

The existing ambient air quality in the vicinity of the Breedon Cement site is broadly representative of a rural environment. There are no major population centres in the immediate vicinity of the site and the only significant commercial or industrial activity is the existing industrial activity at the site and the surrounding agricultural activity. There is a proposed solar farm on lands owned by Breedon Cement in the larger land-holding. The nearest population centre, Kinnegad village, is located approximately 2.5km northeast of the site. The nearest industrial facility to the site is the Edenderry Power Limited Power Generation Plant located approximately 12km south east of the site in Ballykilleen, Edenderry, County Offaly (IPPC Licence Register No. PO482-04). The M4 Kinnegad-Enfield-Kilcock Motorway runs past the site

approximately 2km to the north. Breedon Asphalt Ltd operate an asphalt plant for the production of road surfacing materials adjacent to the existing limestone quarry.

The dominant influences on local air quality include domestic heating sources, traffic, agricultural activities, the nearby asphalt plant, and the existing quarries and cement plant at the site. The power generation plant mentioned above is located approximately 11 – 12km away and is considered too far away to exert a significant influence on the local air quality.

The main substances which are of interest in terms of existing air quality are sulphur dioxide, nitrogen oxides, particulate dusts including PM_{10} and $PM_{2.5}$ which could originate from combustion sources, traffic and the current quarry activity and cement production operations. These are no new or additional substances expected to be present in emissions released from the proposed development as the proposal is for an increase in quarry depth only. There will be no change to the rate of raw material extraction or to production process or output as a result of this proposal.

A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development. There are no other significant influences on ambient air quality in the vicinity of the site. The emissions from agricultural activities will include methane from ruminants and ammonia. Neither of these substances have the potential to be considered significant releases from the proposed development, so the proposal will have no impact on the atmospheric budget of these substances in the area.

9.4.3 Existing Ambient Air Quality

9.4.3.1 Influences on Existing Air Quality

Air quality monitoring was conducted in the vicinity of the site over an extended period from prior to construction of the cement plant and associated quarry. Data for the period 2018–2021 was reviewed to describe existing air quality in the area. The scope of monitoring included sampling for dust deposition, particulates (PM_{10} and $PM_{2.5}$) and arsenic. The application site and wider landholding is governed by EPA Industrial Emissions (IE) Licence Ref: P0487-07. Continuous monitoring of emissions to atmosphere of various substances emitted from the cement manufacturing activity is undertaken in accordance with the IE licence for the site. The available data, discussed in detail below, demonstrates full compliance with the terms of the company's IE Licence and compliance with the relevant ambient air quality standards.

Longer term monitoring data would give a more reliable indicator of air quality in the area and a review of published data for similar locations over longer time frames is presented in the following section. Data for a broader range of parameters is also reviewed to give a more comprehensive picture of air quality in the area.

9.4.3.2 Particulate Matter and Dust

Since construction activities at the existing facility commenced in June 2000, dust deposition levels have been and continue to be routinely monitored on a monthly basis in accordance with the IE licence for the site (IE Ref. P0487-07). A summary of the dust deposition monitoring results for the period January 2018 to May 2022 are presented in Table 9.4.2. From the results presented it is clear that existing permitted quarrying and cement production activities have not resulted in unacceptable dust levels beyond site boundaries.

Particulate matter is made up of tiny particles in the atmosphere that can be solid or liquid and is produced by a wide variety of natural and manmade sources. Particulate matter includes dust, dirt, soot, smoke and tiny particles of pollutants. Particulate matter of 10 micrometers in aerodynamic diameter or less are also referred to as PM_{10} or more strictly, particles which pass through a size selective inlet with a 50% efficiency cut-off at 10 um aerodynamic diameter. Similarly, $PM_{2.5}$ refers to particulate matter of 2.5 micrometers or less in aerodynamic diameter. The significance of particulate matter is predominantly related to human health and respiratory effects.

PM_{10} and $PM_{2.5}$ monitoring was carried out at specified points on the site in accordance with the IE licence for the site (IE Ref. P0487-07). Monitoring was carried out between January 2018 – May 2022. The results of the monitoring have shown that air quality is in compliance with the limits stated in SI No. 271 of 2002 Air Quality Standards regulations of 50µg/m^3 and 25 µg/m^3. The results of the monitoring are summarised in Table 9.4.2 and Table 9.4.3. The data clearly show that existing air quality is good with the measured levels of dust deposition, PM_{10} and $PM_{2.5}$ very significantly lower than the Air Quality Standards and Licence ELVs.

Table 9.4.2: Average Monthly dust deposition rate (Jan 2018 – May 2022)

Sampling Interval	Dust Deposition Rate (mg/m^2 - day)	Licence ELV (mg/m^2 - day)
2018	6.1	130 (D5), 240 (other locations)
2019	3.4	130 (D5), 240 (other locations)
2020	8.8	130 (D5), 240 (other locations)
2021	8.8	130 (D5), 240 (other locations)
2022	10.4	130 (D5), 240 (other locations)
Period average	***7.5***	130 (D5), 240 (other locations)

Table 9.4.3: Annual PM_{10} Monitoring Results at Breedon Cement Ltd (Jan 2018 – May 2022)

Data Set	Concentration µg/m^3					Air Quality Standard
	2018	2019	2020	2021	Average	
D1	6	14	14	6	10	50µg/m^3 24-hour averaging period
D2	14	11	18	28	17.75	
D3	25	31	4	21	20.25	
D4	6	9	11	13	9.75	
D5	5	25	14	26	17.5	
D6	8	10	6	11	8.75	
D7	24	15	16	24	19.75	
D8	8	6	4	8	6.5	

Table 9.4.4: Annual $PM_{2.5}$ Monitoring Results at Breedon Cement Ltd (Jan 2018 – May 2022)

Data Set	Concentration µg/m^3					Air Quality Standard
	2018	2019	2020	2021	Average	
D1	6	9	9	13	9.25	25µg/m^3 24-hour averaging period
D2	9	5	20	9	10.75	
D3	19	14	21	9	15.75	
D4	5	8	12	5	7.5	
D5	9	11	11	12	10.75	

D6	8	10	21	10	12.25
D7	15	14	13	15	14.25
D8	10	5	6	9	7.5

9.4.3.3 Long Term Air Quality Data

A description of existing levels of the various substances in ambient air is required to allow completion of the evaluation of air quality impacts associated with the development. The available data from the National Ambient Air Quality Network is a reliable data set for consideration in this study as shown below.

The Environmental Protection Agency (EPA) and local authorities maintain and operate a number of ambient air quality monitoring stations throughout Ireland in order to implement EU Directives and to assess the country's compliance with national air quality standards. Ireland's small population and generally good air quality means that a relatively small number of monitoring stations are sufficient across the country for the purposes of implementing the EU Air Directives. For ambient air quality management and monitoring in Ireland, four zones, A, B, C and D are defined in the Air Quality Standards (AQS) Regulations (S.I. No. 180 of 2011) and are defined as follows:

- Zone A: Dublin Conurbation.
- Zone B: Cork Conurbation.
- Zone C: 24 cities and large towns. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Newbridge, Mullingar, Letterkenny, Celbridge and Balbriggan, Portlaoise, Greystones and Leixlip.
- Zone D: Rural Ireland, i.e., the remainder of the State excluding Zones A, B &C.

The Breedon Cement Ltd site is considered to be located in Rural Ireland which is categorised as Zone D for assessment purposes. Air Quality Data from representative air monitoring stations in Zone D are therefore considered representative of air quality at the subject site. The EPA publishes Ambient Air Quality Reports every year which details the air quality in each of the four zones. The most recent report, published by the EPA in 2021, is the Air Quality in Ireland 2020, which contains monitoring data collected during 2020. Best practice requires that an average of at least three years of recent monitoring data is used for assessments of this type so data for 2018, 2019, and 2020 has been reviewed. A summary of the data for representative Zone D stations for the three most recent years is presented for each parameter of interest in Table 9.4.5. This is the data set which is used in the assessment of the potential impact of the proposed development on air quality.

Table 9.4.5: Summary long term air quality data (2018 - 2020)

Data set	Parameter and averaging interval		Concentration µg/m³		
			2018	2019	2020
Rural Zone D	Nitrogen dioxide NO_2	*Annual Mean, µg/m³*	4.7	5.7	7.6
Rural Zone D	Nitrogen oxides, NO_x	*Annual Mean, µg/m³*	6.7	7.8	15.9
Rural Zone D	Particulate Matter PM_{10}	*Annual Mean, µg/m³*	11.8	14.3	11.2
Rural Zone D	Particulate Matter $PM_{2.5}$	*Annual Mean, µg/m³*	9.4	9.3	7.8
Rural Zone D	Sulfur dioxide, SO_2	*Annual Mean, µg/m³*	2.6	3.1	4.2
Rural Zone D	Ozone	*Annual Mean 8-hour, µg/m³*	62.1	64.1	61.6

Note Data summarised from the EPA Annual Ambient Air Quality Monitoring Reports 2017 to 2020.

9.5 Identification of Likely Significant Impacts

9.5.1 Existing Activities

The main potential impacts on air quality associated with the existing activities at the site relate to emissions of dust, PM_{10} and combustion gases such as SO_2 and NO_2. The proposed quarry deepening will not result in any change in the nature of the emissions from the existing and related activities at the site.

A mobile primary crushing plant is located on the quarry floor and crushed material from this location is transported to the production plant via a closed conveyor system which significantly reduces the number of internal site vehicle movements required to transport raw materials and as a result minimises the levels of fugitive dust that may be generated by internal vehicle movements on unpaved internal haul roads. Management practices and mitigation measures are employed for minimising the potential particulate matter emissions.

The existing facility is fuelled using coal, petcoke, fuel oil and up to 40 alternative bio-fuels as defined in the European Waste catalogue (EWC). The potential emissions from this activity include combustion gases, PM_{10}, $PM_{2.5}$, Dust, CO and CO_2. Breedon is currently licensed to use 105,000 tonnes of alternative fuels per annum (IE Ref. P0487-07). Emissions from traffic include pollutants such as sulphur dioxide, nitrogen oxides, carbon monoxide and traces of VOCs. In addition, the HGVs will contribute to PM_{10} emissions from the diesel engines. There will be no change to the number of HGV movements as a result of this proposal.

Sulphur dioxide emissions originate from the sulphur in the fuels used in the combustion process. A significant portion (70-95%) of the sulphur dioxide generated in the combustion process is absorbed by chemical reaction in the alkaline clinker so the actual emission rate of sulphur dioxide is substantially lower than it would be from a combustion source where no absorption takes place.

Nitrogen oxides are present in the emission stream as a result of the combustion process, with contributions from both the materials burned and also the combustion technology. Much of the emissions will be in the form of nitric oxide (NO) which is expected to be substantially oxidised to nitrogen dioxide in the atmosphere.

Particulate matter may arise in the emission stream from the combustion process; in view of the existing abatement measures, this is likely to be present in the form of PM_{10}, i.e., particulate matter with an aerodynamic diameter less than 10µm and $PM_{2.5}$, i.e., particulate matter with an aerodynamic diameter less than 2.5µm.

Carbon monoxide (CO) is emitted as a result of incomplete combustion, and carbon dioxide (CO_2) is one of the main products of combustion together with water vapour.

The discharges are regulated under the terms of EC Directive 2000/76/EC, which limits the concentrations of various substances which may be released from the activity. The Emission Limit Values which have already been applied in the IPPC Licence for this site (P0487-7-07) are summarised in Table 9.5.1. The complete list of substances regulated includes the following:

- Sulphur dioxide (SO2);
- Nitrogen dioxide (NO2);
- Total dust;
- PM10 and PM2.5;
- Carbon monoxide (CO);
- Carbon dioxide (CO2);
- Total Organic Carbon (TOC);
- Hydrogen Chloride (HCl);
- Hydrogen fluoride (HF);
- Ammonia slip
- Dioxins and furans;
- Metals and their compounds, including Cd, Tl, Hg, Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V.

An asphalt plant owned and operated by a sister company, Breedon Asphalt Ltd, on an adjoining site is also expected to contribute to ambient air quality in the area. The main emissions from this facility include particulate matter and some minor amounts of combustion gases (CO, CO_2, NO_x and SO_2).

9.5.2 Construction Phase Impacts

The proposed development involves the deepening of the north-western portion of the quarry extraction area by four extractive benches to 10m OD, over an area of c. 4.13 hectares. This proposal is designed to improve both the viability and sustainability of Breedon Cement's operation through the continued use of locally available raw materials.

There is no significant construction associated with the implementation of the proposed development as the site is currently operational, and the area has already been subjected to quarrying activity with removal of overburden. This application is in relation to the deepening of the existing quarry, and the development will not involve a construction phase and therefore impacts associated with construction will be negligible.

There are no European or Designated Sites within 50m of the site boundary, which is the threshold distance for ecological sensitivity to dust. Therefore, there are no significant Construction Phase air quality impacts predicted for ecological sites from construction works, and this element is not assessed further.

9.5.3 Operation Phase Impacts

The proposed quarry extension is to ensure an economic source of limestone which will have no transportation emissions associated with its delivery to the manufacturing site. However, it should be noted that there will be no change to the rates of extraction or to the cement manufacturing process as a result of this proposal. Raw material extraction rates will remain at current levels as will the output of cement product.

The impacts associated with the quarry extension will remain the same as the current impacts associated with the operation of the quarry. There will be no change in the substances which may be present in the emissions from the quarry operation and the main emissions to atmosphere will be dust. There will be no increase in plant or machinery associated with the quarry extension and consequently the current overall level of emissions from the quarry will not change.

There will be no change in either the quantity or nature of the substances which will be present in the emissions from the cement manufacturing facility as a result of the proposed development. Cement manufacturing will continue as currently permitted with no change as a result of the proposed development.

9.5.4 Climate Impact

The principal greenhouse gas (GHG) emissions associated with construction are carbon dioxide, nitrogen oxides, and trace amounts of VOCs from transport and machinery utilised in construction as well as the continued production of the quarry. For the Do Nothing Scenario, if the proposed development does not proceed then the emissions of GHGs in the area are projected to remain the same. The existing permitted quarry will continue to operate and the GHG emissions associated with existing permitted activities would continue. Therefore the overall impact of each of the potential scenarios assessed would be the same.

9.5.5 Traffic Impacts

The movements of HGV's and staff vehicle movements will contribute to emissions of gaseous pollutants such as sulphur dioxide, nitrogen oxides, carbon monoxide and traces of VOCs. In addition, diesel engines from HGVs will contribute to PM_{10} emissions, the dominant source of this pollutant in urban atmospheres.

There will be no change to the traffic movements as a result of the proposed development. There will be no additional staff or plant and machinery required to facilitate the proposed development and therefore the number of HGV traffic movements and employee vehicle movements will remain unchanged.

9.6 Air Quality Impact Assessment

9.6.1 Existing Activities

9.6.1.1 Quarrying and Related Activities

The main potential impact on ambient air quality from the current activities will be that associated with deposition of dust generated by excavation, transfer, and processing operations.

The assessment of the potential impact of the fugitive dust emissions arising from all sources at the site is based on the impact of the dust deposition rates in the vicinity of the site. The results of the comprehensive dust deposition monitoring programme carried out at the site since July 2000 clearly show that the existing site activities do not exert an adverse impact as average dust deposition rates are substantially lower than the limits specified in the IE Licence (IE Ref. P0487-07). Table 9.4.2 shows the average dust deposition levels at locations around the Breedon Cement site. The average monthly dust deposition rate measured in the area during the period January 2018 to May 2022 was 7.5 mg/m^2-day or 5% of the limit value of 130 – 240 mg/m^2- day. The dust deposition monitoring programme continues to show that site activities do not result in unacceptable fugitive dust emissions extending beyond site boundaries and that best management practices at the site are effective in minimising fugitive dust emissions even during the drier summer months when the potential for fugitive dust emissions is at a maximum.

9.6.1.2 Cement Plant

The regulatory limits are designed to ensure that no adverse impact arises from the operation of the plant. The data shows that the impact of the existing activity and associated works is lower than accepted levels of impact as evidenced by the compliance record. There will be no change to the emissions from the cement plant as a result of the proposed development.
Continuous monitoring of emissions to atmosphere of substances which may be present in the emissions has been completed as part of routine compliance monitoring requirements associated with the IE Licence (IE Ref. P0487-07). The measurements include measurements of metals, hydrogen chloride, hydrogen fluoride, and of dioxins and furans in emissions from the existing cement manufacturing activity. Emissions to atmosphere of all of these substances were found to be low, compliant with Licence Limits and do not exert an adverse impact on air quality in the area.

9.6.2 Proposed Quarry Deepening

The proposed development consists of a deepening of the quarry in a small area within the existing footprint of the permitted quarry. There will be no change in either the quantity or nature of the substances which will be present in the emissions from the quarrying activity as a result of the proposed development. This is because there is no increase in the rate of extraction or production proposed. Since the quarry area will be deepened rather than continuing at the existing level, the emissions will be effectively contained within the excavation area potentially reducing rather than increasing the dust deposition rates in the vicinity of the site.

9.6.3 Cumulative Impacts

The cumulative impacts of the proposed development in conjunction with current and future developments in the vicinity of the subject site are considered in this section. Guidance published by the European Commission (1999, Guidelines for the Assessment of Indirect and Cumulative Effects as well as Impact Interactions) was considered in carrying out this element of the assessment. A review of other existing and / or approved projects in the vicinity of the site was carried out and these projects were considered to determine whether any of these existing / approved projects will likely have significant cumulative effects in combination with the proposed project.

Permission has been sought (Ref 22/958) to build a Solar PV Energy Development on lands to the north east of the proposed quarry deepening area on lands owned by Breedon Cement. The proposed solar development extends over an area of approximately 21.8 hectares in two land parcels (eastern parcel c.18.5 hectares, western parcel c. 3.3 hectares). The development will consist of the installation of Solar Photovoltaic (PV) panels on ground mounted frames / support structures within existing field boundaries; 2 No. 6kVA transformer stations; inverters/transfer units; 1 No. customer ring main unit; underground cabling and ducting; internal site access tracks; site perimeter (stock-proof) security fencing; with new vehicular access from L8021 serving the eastern parcel; and from unnamed access road off L8021, serving the western parcel; and all associated landscaping including screen planting; and site development works.

There is potential for cumulative impacts on air quality to arise during the construction phase of the proposed solar development. The potential cumulative impact relates to dust deposition associated with site activities. As shown in Section 9.4.3, the existing air quality is extremely good with ongoing monitoring demonstrating compliance with all Licence Emission Limit Values and Air Quality Standards and the existing baseline is less than 5% of the permissible

levels of dust deposition. The proposed solar development construction phase would involve transport of materials to the site, some ground preparation activity including preparation of site roads and some construction works for infrastructure associated with the proposed solar development. These activities have some limited potential for release of dust and particulate matter. The proposed solar development is located predominantly downwind of and at a distance from the proposed quarry deepening area which minimises the potential for cumulative impacts from air emissions to arise. The existing monitoring programme demonstrates that dust and air quality impacts are well within permissible levels and whatever minor emissions may be released during the construction phase of the proposed solar development will not exert a significant adverse impact on air quality in the area even in combination with the existing emissions from the cement plant and quarry, which will be unchanged if the proposed quarry deepening proceeds.

9.7 Do Nothing Scenario

If the proposed development does not proceed, then emissions to atmosphere will remain as they are at present. However, the supply of economically and environmentally sustainable raw materials available from the on-site quarry would eventually run out and raw materials would have to be imported from elsewhere to the site. This would have a negative impact on the transport emissions associated with the supply of raw material for the manufacture of cement and would inevitably result in increased greenhouse gas emissions associated with the overall cement manufacturing process at the facility. By deepening the existing quarry, there will be no increased emissions as a result of the proposal and additional transport and greenhouse gas emissions are avoided as no additional transport to the site is required.

9.8 Human Health Impacts

Air Quality Standards (AQS) are set to protect vulnerable people, such as those with respiratory illnesses, the old and infirm. Hence, the human health impact assessment has relied on evaluating compliance with the AQS to determine whether significant impacts will arise on human health or not.

The air quality impact assessment notes that dust and particulate matter are the primary sources of construction related impacts for the proposed development. There is no construction phase since construction has already been completed as a part of the permitted development. The potential human health impact during construction is therefore imperceptible.

There will be no significant emissions to atmosphere during the Operation Phase and the impact has been assessed as imperceptible. Therefore the potential human health impact during Operation is imperceptible.

9.9 Residual Impacts

There will be no residual impacts arising from construction. Potential operation phase impacts are predicted to be imperceptible and long-term.

9.10 Interactions Arising

The main interactions with air quality are in relation to human beings and biodiversity.

The impact of air quality on human beings living in the area of the proposed development has been addressed above for both the construction and operational phase of the proposed

development. The impact assessment shows that the air quality impacts that will be experienced by human beings in the vicinity of the proposed development are all within the prescribed criteria. This interaction is described as neutral for the operational phase and is quantified as imperceptible.

In relation to the interaction of emissions to atmosphere from the proposed development with flora and fauna, Table 9.3.2 sets out Air Quality Standards for the protection of vegetation and ecosystems. This assessment has shown that the emissions generated from the development are very limited and do not have potential to generate a significant adverse impact on the local ecosystems including birdlife and wildlife. Air Quality in the area is good as shown in Section 9.4.3 and the Air Quality Standards will not be exceeded as a result of the development thereby ensuring that no significant adverse impact on ecosystems arises. This interaction is described as neutral and quantified as Not Significant.

9.11 Monitoring

In order to mitigate against air quality effects at receptors, Best Practice Measures will be adopted. A comprehensive environmental management and monitoring programme is in place at the existing licensed facility and this programme will continue to be implemented and will be enhanced when opportunities are identified.

9.12 Accidents or Unplanned Events

There are no accidents or unplanned events as a result of the proposed development that could occur that will have an adverse or significant impact on air quality or climate that have not already been considered in this chapter.

9.13 References

Environmental Protection Agency (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

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Institute of Air Quality Management (2014). Guidance on the Assessment of Dust from Demolition and Construction.

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European Union (1996). Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management [1996].

European Union (2004). Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air [2004].

European Union (2008). Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe [2008].

Climate Action and Low Carbon Development Act 2015

Climate Change and Low Carbon Development Act (Amendment) Act 2021

Air Quality Standards Regulations 2011 – S.I. No. 180 of 2011

Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 – S.I. No. 58 of 2009